

# LBL $\rightarrow$ beam $\rightarrow$ DUSEL

- *Science*
  - *Neutrino oscillations*
    - *Measurement of mass and mixing matrix*  
 *$\Delta m^2$ 's, mixing angles, mass hierarchy, CP violation*
    - *New Physics*
  - *Current and planned experiments are beginning to make these measurements*
    - *Mini-Boone and MINOS at FNAL*
    - *T2K in Japan, Nova (FNAL  $\rightarrow$  Sodan) ??*
  - *Existing and planned experiments will not have the capability of achieving the ultimate scientific goals*

# LBL □ beam □ DUSEL

- ***Facilities***

- Existing facilities do not meet the requirements of the Science that we will be trying to do in ~10 years
  - Ongoing and soon to run experiments will produce results that may influence the way we approach the science
    - Remember where we were 10 years ago...; even 5 years ago
- **Accelerator**
  - **BNL, FNAL**
    - **Proton Intensity & Energy**
      - » **BNL : 28 GeV p**
      - » **FNAL : 8 - 120 GeV**
      - » **Both Labs would need accelerator upgrades to produce multi MW protons sources**
    - **Distance to detector**
      - » **≥ 1000K desirable**
      - » **Upper limit - constructability issues**

# DUSEL & LBL experiments

## **National Academies Study : Neutrinos and Beyond**

..... and it must be located more than 1000 kilometers from accelerators capable of producing intense beams of neutrinos.

The latter would allow the use of such beams to study the properties of neutrinos as they travel over long distances, helping to measure the small but important neutrino masses.

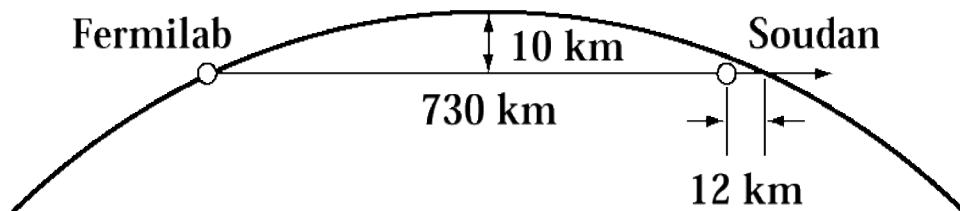
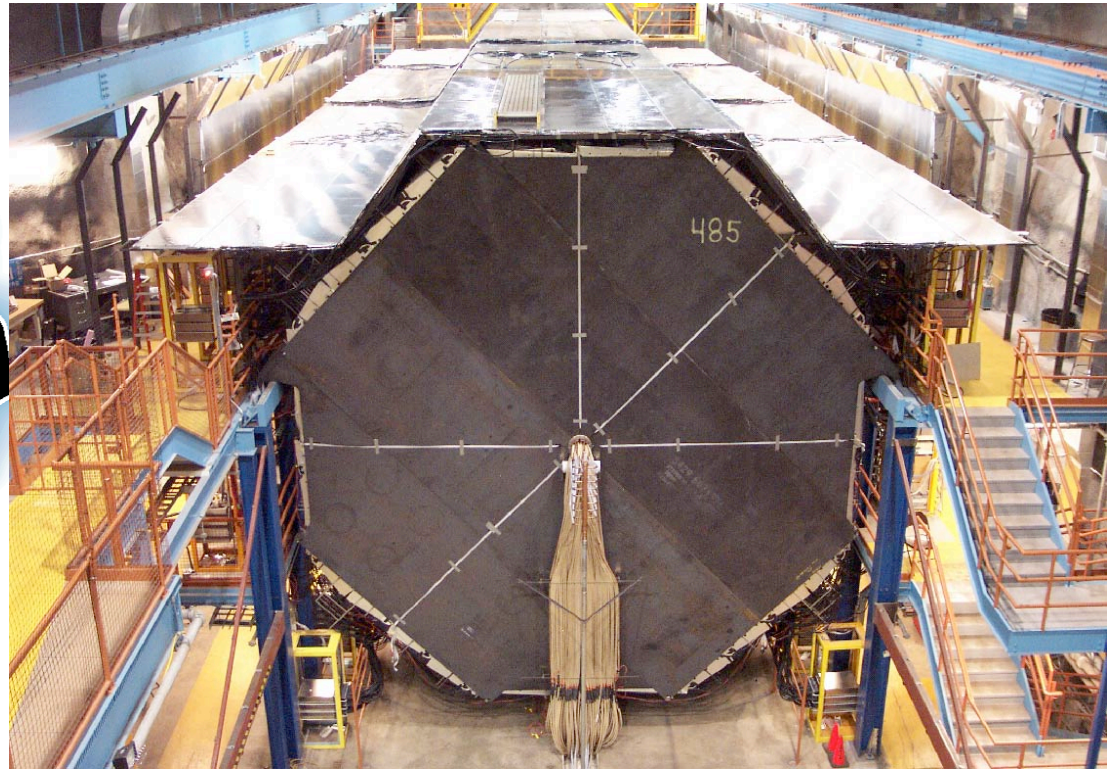
Siting the lab in the United States would permit the utilization of its powerful particle accelerators already operating.

## **Facilities for the Future of Science : A Twenty-Year Outlook**

Far Term Priorities : tied for #21

A Super neutrino beam powered by a megawatt class proton driver

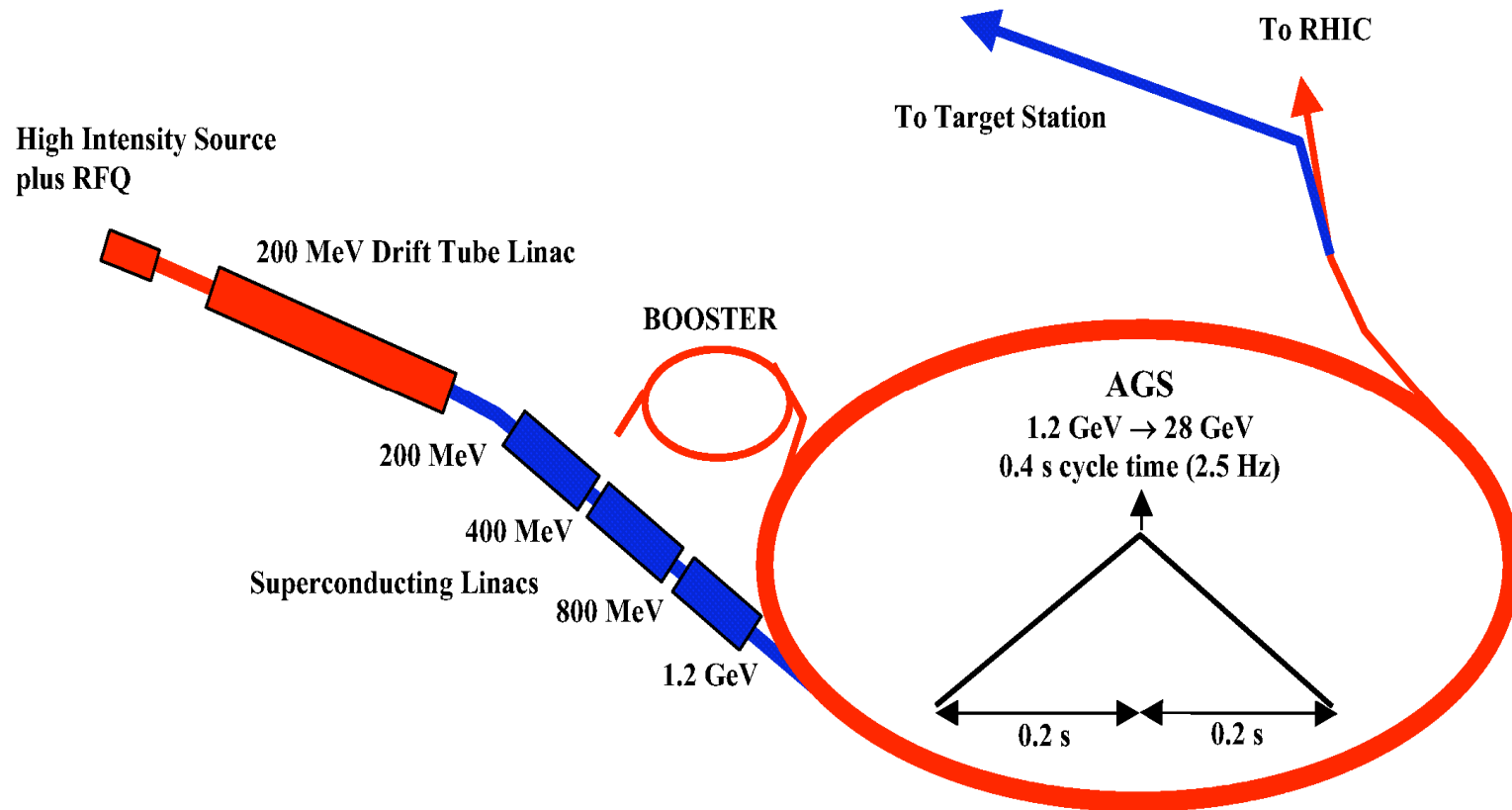
# MINOS: Right Around the Corner



# Our Highest Priority Recommendation

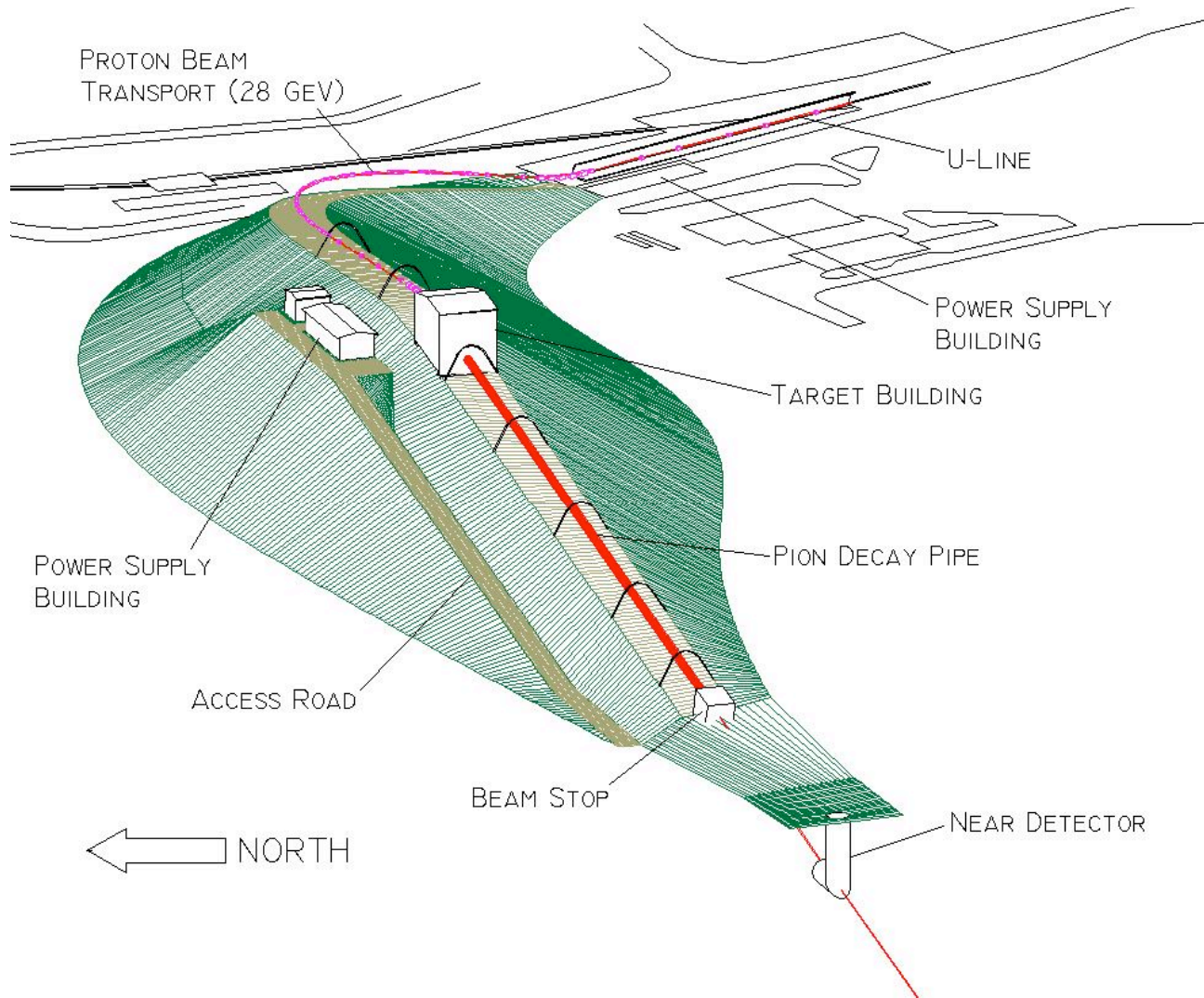
- Build a new MW+ class proton driver, neutrino Superbeam and very massive detector in the United States.
  - This is necessary for a broad range of future accelerator neutrino experiments, and in particular is essential for the long-baseline experiments.
  - Increase in proton power for neutrinos by a factor of 10-20.
  - Studies advancing at Fermilab and Brookhaven. Our recommendation is site independent, but long baselines are essential.

# AGS Target Power Upgrade to 1 MW



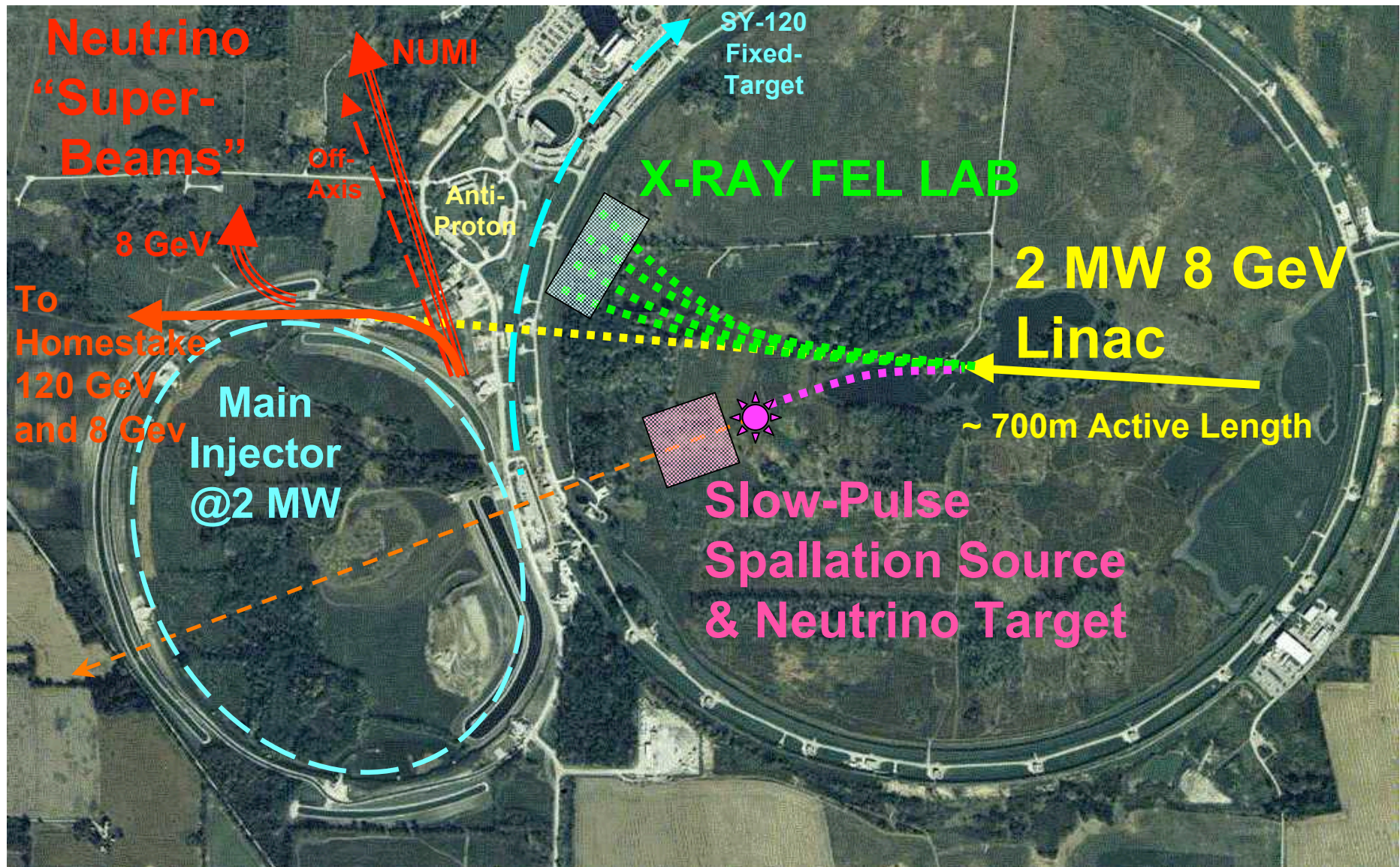
- the *AGS Upgrade* to provide a source for the 1.0 MW Super Neutrino Beam will cost \$265M FY03 (TEC) dollars  
Additional upgrades to 2 MW under study

# 3-D Neutrino Super Beam Perspective





# A new proton driver at Fermilab



Also includes upgrades to Main Injector for current and cycle



## BNL → Homestake Super Neutrino Beam



28 GeV protons, 1 MW beam power  
500 kT Water Cherenkov detector  
5e7 sec of running, Conventional Horn based beam